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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/859,482	05/18/2001	Mark Verrall	MERCK-1972 D1	5264

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EXAMINER

HON, SOW FUN

ART UNIT PAPER NUMBER

1772

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center"><b>Office Action Summary</b></p>	<b>Application No.</b> 09/859,482	<b>Applicant(s)</b> VERRALL ET AL.	
	<b>Examiner</b> Sow-Fun Hon	<b>Art Unit</b> 1772	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 14 and 16-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 35 is/are allowed.
- 6) ☒ Claim(s) 14, 16-28 and 30-36 is/are rejected.
- 7) ☒ Claim(s) 29 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 09/254,185.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)<br>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)<br>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____. | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____.<br>5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)<br>6) <input type="checkbox"/> Other: _____. |
|--|--|

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/24/04 has been entered.

### ***Withdrawn Rejections***

2. The 35 U.S.C. 112, 2<sup>nd</sup> paragraph rejection of claim 31 has been withdrawn due to Applicant's amendment dated 03/24/04.
3. The 35 U.S.C. 102(b) and 103(a) rejections in the office action dated 09/22/03 have been withdrawn due to Applicant's amendment dated 03/24/04.

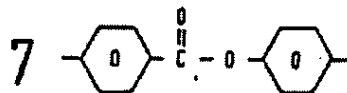
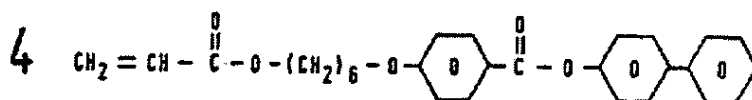
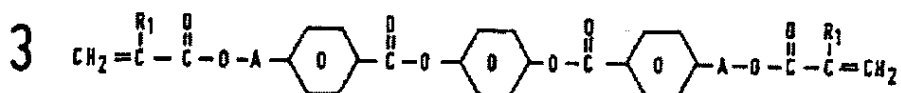
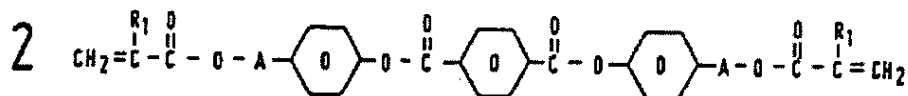
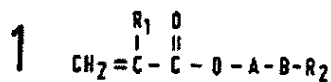
### ***New Rejections***

#### ***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claims 14, 19-22, 27-28, 30-32, 34, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Broer (previously cited US 4,892,392) in view of Raynes (US 4,084,884).

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Regarding claim 14, Broer has a polymer layer obtained by polymerizing a material comprising at least one compound of the formulae 1 to 4 (column 3, lines 30-35) shown below, corresponding to Applicant's generic formula  $P-(Sp-X)_n-MG-R$  as explained on the next page. The monomers are mesogenic (column 3, lines 55-60). The monomer is oriented at a given angle and then polymerized (column 2, lines 32-36). Thus the resultant polymer exhibits a tilted structure with an optical axis having a tilt angle  $\theta$  relative to the plane of the layer that is greater than zero. The polymer layer is anisotropic (column 4, lines 25-35).



Broer's A = bivalent radical such as  $(CH_2)_x$  (column 3, lines 15-20) is equivalent to Applicant's spacer group Sp and encompasses the range of 1 to 20 C atoms;  $n=1$ ;

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Broer's B = mesogenic group such as formulae 7 and 8 (column 3, lines 20-25) is equivalent to Applicant's mesogenic group MG where r is 0, m is 0, wherein Applicant's  $A^2$  group =  $A^3$  group = 1,4-phenylene,  $Z^2$  group = -COO-;

Broer's  $R_1$  = H or  $CH_3$  (column 3, lines 20-25) is equivalent to Applicant's W group; and Broer's  $R_2$  = alkyl group (column 3, lines 20-25) is equivalent to Applicant's R group and encompasses the range of up to 25 C atoms, a cyano group and a combination thereof. Applicant's P group is the  $CH_2=CR_1-COO-$  which forms the left end section of Broer's compounds 1 and 2.

Broer's compound 1 has one polymerizable group, and compounds 2 and 3 have two polymerizable groups, an ethylenically unsaturated group  $CH_2=CR_1-$  on both ends of compounds 2 and 3.

Regarding claim 19, Broer teaches that the temperature at which the orientation of the mesogenic group is carried out, may be reduced by using a mixture of monomers (column 4, lines 10-20). Therefore it would have been obvious to one of ordinary skill in the art to have added Broer's compound 1 with one polymerizable group to Broer's compounds 2 or 3 with 2 polymerizable groups.

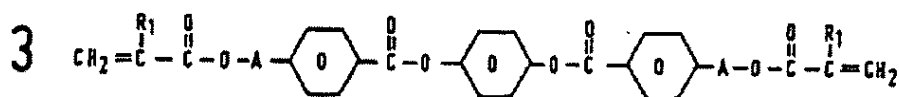
Regarding claims 20, 31, Broer's B = mesogenic group such as formulae 7 and 8 below (column 3, lines 20-25) is equivalent to Applicant's mesogenic group MG where r is 0, m is 0, and wherein Applicant's  $A^2$  group =  $A^3$  group = 1,4-phenylene,  $Z^2$  group = -COO-;



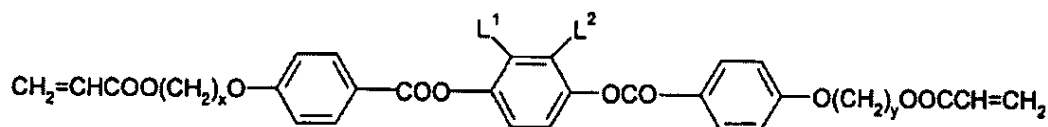
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Regarding claim 21, Applicant's P group is the  $\text{CH}_2=\text{CR}_1\text{-COO-}$  which forms the left end section of Broer's compounds 1 and 2.

Regarding claim 22, Broer's compound 3 below has  $\text{A} = (\text{CH}_2)_x\text{O}$  (column 3, lines 15-20) and Broer's  $\text{R}_1 = \text{H}$  or  $\text{CH}_3$  (column 3, lines 20-25).



This structure corresponds to Applicant's claimed structure of



where  $\text{L}^1$  and  $\text{L}^2$  of Applicant = H.

Regarding claims 27, 34, Broer teaches that less than 10 % by weight of photoinitiator is added (column 4, lines 20-35) which encompasses the claimed range of 0.01 to 5 % by weight of Applicant. It follows that the monomers make up the remainder of the composition in the weight % range of greater than 90 %. This range encompasses the claim limitation of at least 95 % by weight of polymerizable compounds of Applicant's formula I (claim 34) and overlaps the claim limitation of 10 to 99 % by weight of at least one mesogen according to Applicant's formula I having one polymerizable functional group (claim 27).

Regarding claim 28, Broer teaches that the temperature at which the orientation of the mesogenic group is carried out, may be reduced by using a mixture of monomers (column 4, lines 10-20). Therefore it would have been obvious to one of ordinary skill in the art to have mixed Broer's compounds together to compose the greater than 90 % of

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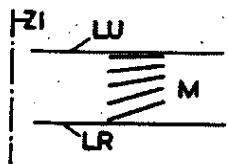
polymerizable compounds that make up the balance for the less than 10 % by weight of photoinitiator (column 4, lines 20-35).

Regarding claim 30, Broer teaches a liquid crystal display (display using liquid crystal) (column 2, lines 55-60) which comprises a liquid crystal cell comprising the polymer layer (column 2, lines 25-35).

Regarding claim 32, Broer's A = bivalent radical such as  $(CH_2)_x$  (column 3, lines 15-20) is equivalent to Applicant's spacer group Sp and encompasses the range of 1 to 20 C atoms; X = single bond, n = 1.

Regarding claims 14, 36, Broer teaches that the tilt angle of the polymer layer induces tilted orientation in the liquid crystal layer (material) (column 3, lines 5-10), but fails to teach that the tilt angle  $\theta$  in each of the layers varies continuously in a direction normal to the layer, starting from a minimum value  $\theta_{min}$  at the side of the layer facing the other layer or, if present, the common substrate, and ranging to a maximum value  $\theta_{max}$  on the opposite side of the layer.

Raynes teaches that the splayed form shown below (abstract), which is the form described in text above, has equivalence with the tilted form (column 6, lines 35-45) of the polymeric layer of Broer in terms of liquid crystal layer structural design.



Therefore Raynes demonstrates that it would have been obvious to one of ordinary skill in the art to have modified the tilted form of Broer to a splayed form in order to obtain a liquid crystal cell with the desired properties associated with the splayed

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form where the tilt angle  $\theta$  in each of the layers varies continuously in a direction normal to the layer, starting from a minimum value  $\theta_{\min}$  at the side of the layer facing the other layer or, if present, the common substrate, and ranging to a maximum value  $\theta_{\max}$  on the opposite side of the layer.

Regarding claims 16-17, 33, although Raynes fails to specify the claimed tilt angles, it can be seen from the figure above, that the minimum tilt angle  $\theta_{\min}$  at the very top of the layer is close to 0 degrees, which is in the claimed range of from 0 to 20 degrees (claim 16); and that the maximum tilt angle  $\theta_{\max}$  at the bottom of the layer is close to 45 degrees, which is in the claimed range of from 20 to 90 degrees (claim 17). The tilt angle thus varies from 0 degrees to 45 degrees, which is within the claimed range of 5-80 degrees (claim 33).

6. Claims 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Broer in view of Raynes as applied to claims 14, 19-22, 27-18, 30-32, 34 above, as evidenced by Gray et al. (US 4,261,652).

Broer has been discussed above and teaches the polymer layers comprising an anisotropic polymer layer exhibiting a tilted structure with an optical axis having a tilt angle  $\theta$  relative to the plane of the layer greater than zero, obtained by polymerizing a polymerizable mesogenic material comprising at least one compound of the formula I:

$P-(Sp-X)_n-MG-R$ , wherein P is a polymerizable group, Sp is a spacer group having 1-20 C atoms, X is a single bond, n is 1, MG is a mesogenic group, R is an alkyl radical encompassing up to 25 C atoms.

Regarding claims 24-25, Broer teaches that  $R_2 = CN$  (claim 25) and B = formula 8 (column 3, lines 20-30). See next page. When substituted into the generic formula 1,



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the dielectric anisotropy of the monoreactive (only left end contains the polymerizable group) mesogenic compound of Broer is inherently greater than + 1.5 (claim 24).



The inherent dielectric anisotropy of greater than + 1.5 is demonstrated by Gray et al.

Gray et al. teaches that if the compound has a terminal cyano group, the dielectric anisotropy of the material will be positive (column 1, lines 65-70), otherwise the dielectric anisotropy is likely to be negative (column 2, lines 1-5). This means that the cyano group provides the compound with a large positive dielectric anisotropy, greater than + 1.5.

Regarding claim 26, Broer teaches that the temperature at which the orientation of the mesogenic group is carried out, may be reduced by using a mixture of monomers (column 4, lines 10-20). Therefore it would have been obvious to one of ordinary skill in the art to have added Broer's dielectrically positive cyano-containing monoreactive compound 1 to Broer's diactive compounds 2 or 3.

Regarding claim 23, although Broer fails to teach the amount of the dielectrically positive monoreactive mesogenic compound, the claimed range of 1 to 80 % by weight is the result of routine experimentation in the absence of a demonstration of unexpected results.

***Claim Rejections - 35 USC § 112***

7. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear how the tilt angle can be substantially constant when it varies continuously.

***Response to Arguments***

8. Applicant's arguments with respect to claims 14, 16-28, 30-34 have been considered but are moot in view of the new ground(s) of rejection.

***Allowable Subject Matter***

9. Claim 35 is allowed.

10. Claim 29 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The terminal disclaimer filed 06/24/03 overcame the double patenting rejection over the closest cited prior art of record US 6,379,758.

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on (571)272-1498. The fax phone number for the organization where this application or proceeding is assigned is (703)872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Sow-Fun Hon

06/07/04

  
HAROLD PYON  
SUPERVISORY PATENT EXAMINER  
1772

6/14/04